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[Title of Invention]

A container-holder attachment.

[Summary] (with modification)

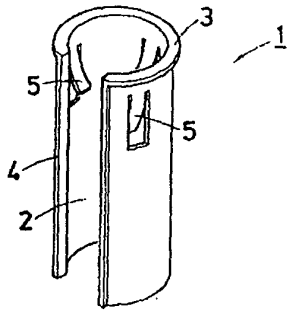
[Purpose]

To offer a container-holder attachment to hold securely and completely upright a tubular container regardless of the diameter or length.

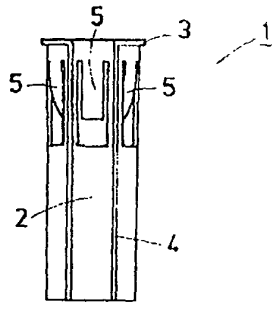
[Design]

The attachment is fitted on the type of a container-holder that has an opening groove to read a bar code: it is a tubular form with a cross section generally forming the letter "C", which has slits corresponding to the said opening groove and multiple flaps that are oriented downward and toward the central axis: and the lower ends of the aforementioned flaps are located above the center of the main body of the attachment so that the effect of the attachment to hold a long tubular container is maximized by sliding the said attachment upward.

(a)



(b)



[Claim]

[Claim 1]

An attachment is fitted inside a closed-bottom insertion hole of a container holder that is equipped with the said insertion hole and an opening groove running in a perpendicular direction; the attachment holds the tubular container in a position relative to the length of the tubular container. The attachment has an open-bottom tubular body; and the presence of a notch at the opening that corresponds to the opening groove results (in a plane view) in an approximation of the letter "C". It is equipped with several flaps inside, which extend downward and toward the central axis. The lower ends of these flaps are located at positions above the center of the main body of the attachment.

[Detailed Description of the Invention]

[0001]

[Areas of Industrial Application]

The present invention concerns a design for an attachment for a container-holder, which holds a tubular container securely and in an upright position regardless of its diameter or length.

[0002]

[Conventional Technology]

In instances such as individual analyses of minute quantities of a sample, small tubular containers are frequently used. These small containers have a very simple structure but they are used widely because they enable various types of testing of a wide variety of samples accurately and simply and allow observation of extremely variable changes. In addition to test tubes, which are in common use, containers that are made of a variety of materials and shaped in various forms are used to suit the purpose of the test. In a test where blood is used as the test fluid, for example, the aforementioned tubular vessel is the container into which the blood is placed.

[0003]

Several of these containers are normally placed in a specially designed holder (the so-called test tube holder or blood-collecting rack) for preservation, transport, and analysis.

[0004]

In tests such as the above-cited hematological analysis, the sizes of the containers are not uniform and hospital laboratories and testing centers must be prepared to handle containers of these different sizes. If these containers are to be placed in a single type of holder (the diameter of the holes where these tubes are placed is necessarily determined by the largest container), those containers with smaller diameters will lean on one side. In addition, the holder is associated with problems, such as spillage of the blood during transport and a failure of a nozzle to enter the container accurately due to tilting during autoanalysis. To remedy these situations, containers are grouped according to their diameters and a specially designed holder is prepared for each size.

[0005]

However the preparation of several types of holders for various diameters of tubes requires additional space and is not economically feasible. In response to this problem, there is a design in which a separate device is fitted along the interior of an insertion hole with a large diameter for larger containers so that the actual diameter may be reduced and the holder may be used for tubes with many different diameters. In this case, the size of the insertion hole is adjusted by using these equipments of various thicknesses. For each diameter, a device of the corresponding thickness must be selected, which is rather bothersome; and the initial problem is not necessarily solved by adopting this design. To eliminate the process of selecting an appropriate device, a single piece that is suitable for various diameters (i.e., a cylindrical structure having inner holding pieces that are increasingly more slanted toward the axis as they approach the ends) has been introduced. Figure 3 (a) and (b) show

an example. The lower end (the free end) of holding piece 91 of part 9 comes into contact with the tubular container, which is securely held by resilience of the holding pieces, which become deformed.

[0006]

[Problems to Be Solved by the Present Invention]

One may assume that containers of various sizes can be securely held by adjusting the hole size according to the diameter of each container, as described above. In reality, however, this is still not satisfactory. Even if limited to hematological tests, the blood-collecting tubes that are sent to laboratories may have different lengths. For the convenience of insertion and removal, the height of the holder is designed so that the top of the shortest tube will be above the holding hole. Thus the longest tubes are held at the lower end in a rather unsteady manner. The lengths of blood-collecting tubes observed by the present inventor range from 50 to 100 mm. If the holder is designed to allow the tube measuring 50 mm in length to project by at least 5 mm above the hole, only 45 mm of the longest tube is held inside the hole. Furthermore holding pieces 71 project downward and their contact sites (the holding positions) are located below the top of the insertion hole. If the length of part 1 is assumed to be 20 mm, a blood-collecting tube measuring 100 mm in length is held at a point approximately 25 mm from its lower end. Thus the design of a single part (or several parts) that are suitable for holding tubular containers of various diameters as well as different lengths is desired.

[0007]

[Method to Solve the Problem]

The present inventor conducted a concentrated study in view of the above-stated problem and completed the attachment of the present invention. This attachment has the following features: it is fitted in a holder that is equipped with closed-bottom insertion holes and opening grooves in the vertical direction; and it slides within the insertion hole and holds a tubular

container that is placed in the said insertion hole at the position corresponding to the length of the said container. The attachment is a bottomless tubular structure wherein a plane view will approximate the letter, "C", due to the slit that is created to correspond to the aforementioned opening groove. In its interior, it is equipped with several flaps that extend downward and are directed toward the central axis; and the lower sections of these flaps are located at points above the center of the main body of the attachment.

[0008]

In this design, the "tubular container" is a closed-bottom tubular container such as a test tube or blood-collecting tube with no specification on its material. Normally, a label on which a bar code containing information concerning the sample and other data is printed is attached to this tube.

[0009]

The "container holder" is an apparatus in which a tubular container is stored. The holder is often designed for the prerequisites of storage, transport, and autoanalysis of the sample while the container is still in this holder. Therefore the container holder is equipped with insertion holes that permit placement and removal of containers; and opening grooves to facilitate reading the bar codes. Each insertion hole is designed to retain a tube by holding it at its lowest and truncal sections, rather than suspending it in midair. Thus the insertion hole is closed at the bottom. Normally the lowest section of the container is rounded; but to improve the holding effect, the bottom of the insertion hole is formed into a curved indentation so that the lower part of the rounded portion of the container will fit.

[0010]

The attachment of the present invention to hold containers is a device that is fitted into an insertion hole of a container holder to retain a "tubular container" securely in this "container holder". It has the capability to slide into the said

insertion hole and hold steadily the said tubular container at a position corresponding to the length of the container to be held. The device is equipped with a slit as an opening corresponding to the opening groove of the holder to enable a bar code to be read even after the container is placed inside the holder. Thus a plane view of the apparatus approximates the letter "C". The apparatus is made of an elastic material and the formation of this letter "C" indicates that by exerting a force in a direction to reduce the space expressed by the break in a full circle, an elastic force is generated to restore the original form (to increase the aforementioned space). If a letter "C" is formed with a diameter that is larger than that of the inner diameter of the insertion hole, the attachment fits tightly in the hole, preventing it from sliding down. Projections and indentations may be formed on either or both of the main body of the attachment and the inner wall of the container holder to serve as stops to hold the attachment at various positions inside the insertion hole.

[0011]

The "flaps" come into contact with the outer surface of a tubular container that is placed in the holder and retain the said container in place. Several of these flaps are created and directed downward and toward the central axis. Their form adjusts according to the diameter of the container. The lower sections of the flaps come into contact with the container; and these sections are designed to be located above the center of the main body of the attachment. In other words, the tubular section of the attachment extends below the location of the lower section of the flaps and the apparatus possesses the capacity to hold the container as long as a certain portion of the lower section is in the insertion hole of the container holder. Thus when a long tube is placed in the insertion hole and the attachment is allowed to slide upward, the position of the lower section of the flaps—i.e., the position to hold the container—moves upward. Multiple flaps (preferably 3 or more) are used for this purpose.

These flaps may be arranged in a vertical position. In such an instance, the location of the "lower ends of the flaps" in the Claim section of the present invention is defined to be the highest position among those of the lower ends.

[0012]

[An Example]

The present example is explained in further detail with the aid of drawings.

[0013]

Figures 1 (a) and (b) show an example of an attachment 1 for a container holder of the present invention (hereafter called attachment 1 of the present invention). As evident from the figures, attachment 1 of the present invention is generally a tubular structure forming in a plane view, the letter "C", due to the presence of notch 2, which runs in a lengthwise direction. It is composed of polypropylene that has been molded into an appropriate shape. It has rim 3 at its upper end and platform 4 that projects outward at the border of slit 2. At the upper section of the interior of the main body, flaps 5 extend downward and toward the central axis and are installed at 3 positions.

[0014]

Figure 2 shows attachment 1 of the present invention, which is placed in insertion hole 7 of container holder 6 where blood-collecting tubes 81, 82, and 83 are set. Each blood-collecting tube has a different length. Attachment 1 of the present invention is capable of a downward sliding motion. For blood-collecting tube 81 with the shortest length, the attachment is set at a lower section; and for blood-collecting tube 83 with the greatest length, it is set at an upper location. Rim 3 at the uppermost section of the main body is created to facilitate removal of attachment 1 of the present invention from insertion hole 7, which may slide further down, making retrieval very difficult. Platform 4 of the border section of slit 2 is fitted in opening groove 61 of container holder 6 and aids in aligning opening groove 61 and slit 2 (if these two do not match, it may

be impossible to read the bar code). However, rim 3 and platform 4 are not essential parts of the present invention and can therefore be omitted (not shown in the figure).

[0015]

[Effects of the Present Invention]

As explained in detail above, the attachment for a container holder of the present invention is fitted into the insertion hole of a container holder that is equipped with opening grooves that run in a vertical direction, in addition to the aforementioned closed-bottom insertion hole. The attachment is allowed to slide within the said insertion hole and holds a tubular container at a position that corresponds to the length of the said tube that is placed in the container. By creating a slit as an opening corresponding to the aforementioned opening groove, the bottomless tubular attachment in a plane view approximates the letter "C". The attachment is equipped with multiple flaps that extend downward and toward the direction of the central axis. The lower ends of these flaps are located above the center of the main body of the attachment. It is an advanced invention that produces the following diverse effects:

(1) The presence of the flaps allows retention of tubular containers regardless of their diameters, eliminating the need to sort the containers according to their diameters.

(2) The attachment is a bottomless tubular structure approximating the letter "C" in a plane view. Thus it does not interfere with reading bar codes even when it slides inside the insertion hole of the container holder.

(3) The lowest ends of the flaps are located at a higher position. Thus the space between the lowest section of the container and the site where it is held by the lower ends of the flaps is extended, augmenting the retaining effect and improving the stability of the container.

(4) When a long container is inserted, the position of the lowest part of the flaps can be moved upward by sliding the main body of the attachment above the insertion hole. Thus a high

degree of stability can be achieved regardless of the length of the container.

[Brief Explanation of Drawings]

[Figure 1]

Both (a) and (b) show an example of an attachment for a container holder of the present invention. (a) is an oblique view and (b), a front view.

[Figure 2]

The figure shows in an application a front view of an attachment for a container holder of the present invention.

[Figure 3]

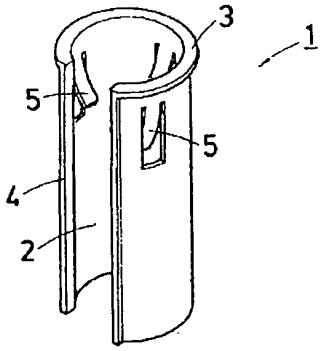
Both (a) and (b) show front views of examples of conventional products.

[Definition of Codes]

1. attachment for a container holder, 2. slit, 3. rim, 4. platform, 5. flap, 6. container holder, 61. opening groove, 7. insertion hole, 81. blood-collecting tube, 82. blood-collecting tube, 83. blood-collecting tube, 9. conventional product, 91. holding piece.

【図1】

(a)



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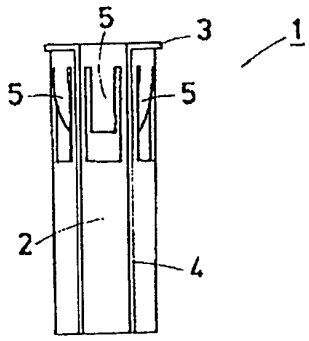
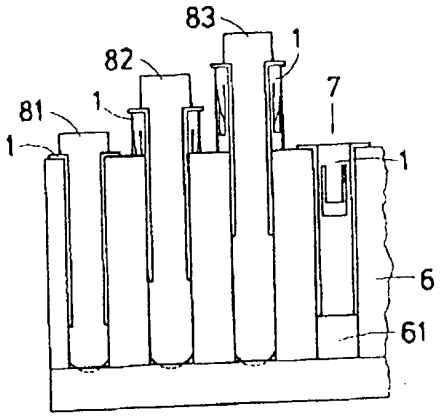
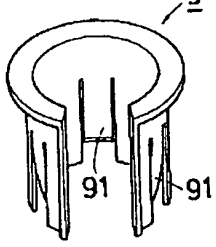


【図2】



【図3】

(a)



(b)